RAILWAY ENGINEERING
and Maintenance of Way

PUBLISHED BY THE
BRUCE V. CRANDALL COMPANY, CHICAGO

Office of Publication, Rooms 409-410 Security Building, Cor. Madison St. and Fifth Ave., Chicago

TELEPHONE MAIN 3185.

Eastern Office: Room 714, 132 Nassau Street, New York City
TELEPHONE 3524 John.

Entered as Second-Class Matter April 13, 1905, at the Post Office at Chicago, Illinois, Under the Act of Congress of March 3, 1879.

A Monthly Railway Journal

Devoted to the interests of railway engineering, maintenance of way, bridges and buildings.
Communications on any topic suitable to our columns are solicited.
Subscription price, $1.00 a year; to foreign countries, $1.50, free of postage. Single copies, 10 cents. Advertising rates given on application to the office, by mail or in person.
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Vol. I. CHICAGO, SEPTEMBER, 1905. No. 6.

Fans in the New York Subway

THE engineering problems involved in the construction of the big bore under Manhattan were numerous enough and sufficiently complex to satisfy those engaged in the work, but a new complication has arisen since its completion, that causes a shrinkage to insignificance of any trials encountered before that event. It is always the unexpected that happens, and in this instance the thing that happened is an atmosphere laden with smells that while not reaching to heaven, go to a height sufficient to cause a dropping off of receipts. Analysis of the air shows it to be as pure as that on the streets above; yet the odor is one that when combined with the summer heat is at least disagreeable, and while the former is known to be due in large part to the lubricating oils used on the trains, and therefore harmless, the latter is several degrees warmer than the air above.

It was expected that the constant movement of trains would operate like pistons and pull a sufficient amount of air into the bore to keep it clarified, and at least as cool as that on the outside. The unexpected was that the trains have not made good in that direction; on the contrary the air lies stagnant, or at least with no motion other than that due to the disturbance of passing trains. For the rise of temperature above what is was before trains were run, many theories have been advanced, but they are too widely at variance to be of any use in a solution of the matter. Immense exhaust and induction fans have been installed at several stations, and these with small fans located on the platforms have worked a remarkable change for the better.

The question is to get the hot air out and cool air in, and this is accomplished very well by the fans, but the volume of air to be moved is so great as to make the fan scheme an expensive one. It has been proposed to lower the temperature by artificial means, as by cold water spray, and an immense system of refrigeration has even been proposed. Natural agencies have not yet presented a feasible way out of the difficulty, and the Subway managers are yet casting about for a means to make the patrons comfortable. How this can be done is one of the live problems connected with subway operation.

Concrete Beams Reinforced

IN view of the interest evinced in the strength in tension of concrete beams when reinforced, any data bearing on the subject is welcome, since very little is known of their performance under load except in private test, and then only for conditions of reinforce rather too meagre to be of value. The tests made by Assistant Engineer Emerson of the Boston Transit Commission are perhaps more thorough than any others yet made in point of the pains taken to secure strict accuracy in results, since all beams were supported at the same points and the load applied at the center, while the deflections within the elastic limit and also permanent set, were made by means of a micrometer adjustable to a silver wire which was stretched between the supports on both sides of the beam. At the neutral axis of the beam a small brass screw was let in and provision made for electric contact between the wire and screw.

The beams were reinforced with steel rods of ½, 7-16 and 9-16 inch, corrugated, twisted and plain, respectively, and placed in the beams in various arrangements, namely: (1) straight along the tension side; (2) curved from the neutral axis at ends to the tension side; (3) curved from the top of the beam at ends to the tension side; (4) straight along tension side and having ½x1 inch straps; (5) straight along both tension and compression sides; (6) same as above with vertical straps.

It is apparent that nothing was neglected to make these tests worthy of the name, and among the points which they demonstrated is the important one that the efficiency of any given type of reinforce, such as the corrugated, twisted or square, depended more on how disposed in the concrete beam than on area, thus, in arrangement (1) there was little difference in the resistance of the beams of similar area of reinforce and of similar load, up to first notation of failure, this being true of the corrugated and twisted metal, the square

and round sections curiously showing the least efficiency.

The same conditions exist in a comparison of results from (2) and (3) in which the former arrangement withstood a considerably greater load before showing signs of failure. This also obtained in results from (1) and (4) and in practically the same ratio for (4) as for (2). One of the most interesting developments revealed in these experiments was the fact that the load that produced the visible cracks in the concrete, was also the load that meant the approach to the elastic limit in the steel of the reinforcement, and another equally valuable bit of information was that referring to the deflection of beams reinforced with corrugated or twisted bars, the deflections when failing in tension being extraordinary before ultimate strength was reached, which for concrete is an unusual thing.

MR. R. H. BOWRON,

GENERAL MANAGER, C. H. & D.

Mr. R. H. Bowron, superintendent of the Northern and Southern divisions of the Cincinnati, Hamilton & Dayton, has been appointed general manager, with headquarters at Cincinnati, O., to succeed Mr. J. A. Edson, resigned. Mr. Bowron began railway work in 1877 as a telegraph operator, and from 1884 to February, 1887, was clerk with the Alabama Great Southern and Mobile & Ohio. He was then superintendent of the Chattanooga Union until January, 1892, and from April, 1892, to April, 1893, was engaged on preliminary work for a projected line. In October, 1894, he went to the Montana Central as chief clerk to the general superintendent, and from September, 1895, to December, 1896, was trainmaster of the same road. During the latter year he was appointed superintendent of the Montana division of the Great Northern, and in July, 1897, was transferred to the superintendency of the Wilmar and Breckenridge divisions. In December, 1898, he was appointed superintendent of the Cascade division of the Great Northern, but resigned in October, 1899, to become superintendent of the St. Louis Southwestern. He was appointed general superintendent of the latter in March, 1900, which position he held until May 1, 1902. He was made division superintendent of the Denver & Rio Grande at Pueblo, Colo., in July, 1903, and resigned in December, 1904, to go to the Cincinnati, Hamilton & Dayton as superintendent of the Northern and Southern divisions.

Concrete Construction

THE increasing use of concrete in railway practice is a revelation to those not intimately in touch with what is going on in new construction, this material having largely supplanted stone for many purposes heretofore deemed an absolute essential to safe work. For foundations and bases for columns it has established itself firmly as the correct thing. In the case of roofing and floor arches it has practically become a standard in the best construction. Culverts are no longer considered necessary of stone, and highway bridges are put up of ample strength in concrete.

One case of a railroad bridge, that over the Big Muddy on the Illinois Central, which has been in use four years supporting the heaviest traffic, is probably one of the best examples of pure concrete bridge work to be found anywhere. This bridge is 674 ft. long and 50 ft. high, having three double track arches of 140 ft. span and 30 ft. rise. It is said to have no reinforcement of any kind, and if this is true it places the bridge in the category of remarkable engineering. Another and more recent concrete bridge, but reinforced and having seven spans, is at Kankakee, Ill.

Experiment is now going forward on a prominent western road, with the view of using concrete piles, particulars of which will be given in these pages when expected results are attained. These piles when perfected on the lines being followed, will no doubt prove the best safeguard against the Teredo, that pest of salt water piling, even yet devised, as well as solving the cost question of piling on that particular road.

A most significant evidence of the value of concrete in railway work is the new lease of life given weak or defective masonry by its aid, as in the case of bridge abutments and piers where the tooth of time or original bad work had made its danger signal. For abutments, the treatment consists in general, of facing with concrete which is supported on grillage when the importance of the case demands it, but usually on a single row of T-rails, the latter as well as the concrete passing under the masonry footing. The treatment for piers is similar but more thorough, as the concrete is made to completely surround it, which with the concrete coping changes the identity of the old work as effectually as though it never had an existence, and besides saving an expensive structure, puts it many times in a better condition than when built.

There is not a little difference of opinion among engineers as to the proportions of cement and broken stone for similar classes of work, also as to the character for reinforcing, by which is meant the shape and section of the steel used. The wisdom of reinforcing is also in question by some who are well up in the technics of concrete work, the ground being taken that it is overdone in many instances. It would appear that some of these points could be cleared up definitely if approached by the right kind of talent.

Hoboken Terminal of the Lackawanna Road

THE work of rearing the new terminal of the Delaware, Lackawanna & Western at Hoboken, N. J., received a quickening on the night of Aug. 7, when the fire fiend literally wiped from the earth every vestige of the old train shed and ferry house, even badly charring the piles and sheeting forming the boat slips. The work of the flames, however, was taken rather as a blessing in disguise than a loss to be deplored, since the work of construction was necessarily slow while the old terminal remained, for the reason that it was the plan of construction to raze the old structure only as fast as work was completed on the new, which will occupy the old site and a considerable area in addition to that. The fire furnished a solution of the problem by giving the builders an unobstructed leeway for prosecuting their work to a rapid completion.

In the new arrangement there will be six slips for the ferry service, which covers the Barclay, Christopher

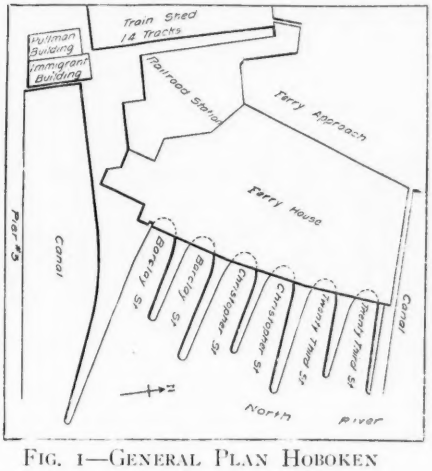


FIG. 1—GENERAL PLAN HOBOKEN TERMINAL, D. L. & W. R. R.

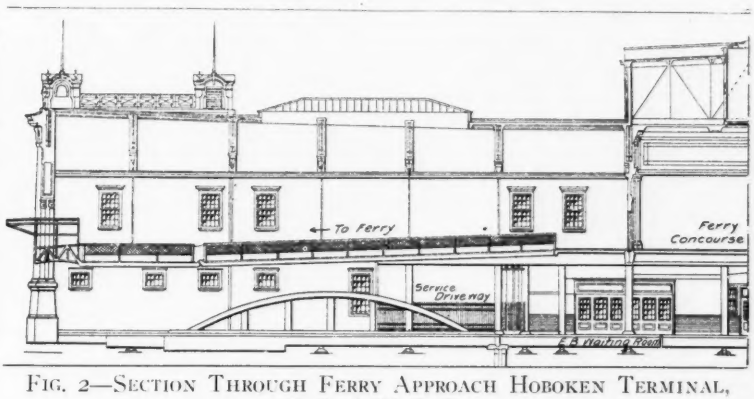


FIG. 2—SECTION THROUGH FERRY APPROACH HOBOKEN TERMINAL, D. L. & W. R. R.

street, and Twenty-third street terminals on the New York side, the latter being new and used jointly with the Pennsylvania, Lehigh Valley, Central of New Jersey and Erie roads, by means of which all the roads named are enabled to land passengers in the shopping district, and also convenient to the play houses. A reference to the general plan of the Hoboken terminal will make clear the relation of the slips and terry house, railroad station, train shed and esplanade before the ferry house. The apparent want of symmetry in the relation of the various units forming the complete whole is made unreal under the magic touch of the architect.

The structure is to be of steel and concrete with the minimum amount of interior wood finish, while the exterior, including the roof, will have a copper covering. The arrangement of rooms is such as to admirably fill all requirements. The main waiting room, which is to be 90x100 ft., by 54 ft. high, will present a clear space unhampered by posts. The walls are formed by steel columns enclosed in concrete, the latter forming all partition walls. Opening from the waiting room will be the retiring room for the ladies, also the smoking room, lunch room, parcel room and information bureau. On the second floor will be the restaurant with a capacity to care for 200 persons, while on the ground floor at track level, and convenient to the waiting room is arranged that necessary adjunct to a railway station—the lunch room. The offices for the ferry officials will be at ground level, while the railway offices, and rooms for the train men will be on the second floor. A waiting room for the use of passengers who desire to use the ferry, will be provided entirely separate from that used for west-bound travel. The baggage room is arranged with the view of avoiding confusion to passengers going in either direction, and is designed to be as easily accessible from the street as from the ferry house.

In order to sustain such a structure as this, in which metal and concrete enters so largely, some engineering problems of no mean order are involved, to safely carry the load. In this case advanced practice in piling and grillage work was resorted to to obtain the necessary stability, which is shown in the illustrations. The train shed which will cover fourteen tracks, will be regarded as not only original in design, but a distinct advance in structures of the kind, affording a continuous covering to the trains as perfectly as the most elaborate and expensive creations. This shed is formed of arched roofs which are supported by fluted cast iron columns placed on the center line of the platforms, and resting on concrete bases which are in turn supported on grill work over piles, the grillage timbers forming a solid whole by extension between columns. The arches have an opening extending longitudinally to carry away smoke and gases, which is a wise provision owing to the restricted head room under the arches. Glass is to be freely used in the roof. The girders forming the arches are riveted up angles and plates which gives a light and airy construction coupled with adequate strength. To Chief Engineer Bush of the Lackawanna is entitled the credit of the happy ideas in the design of this train shed, which is an overturning of previous practice. Mr. Kenneth M. Murchison, architect, of New York City, furnished the design and specifications for this con-

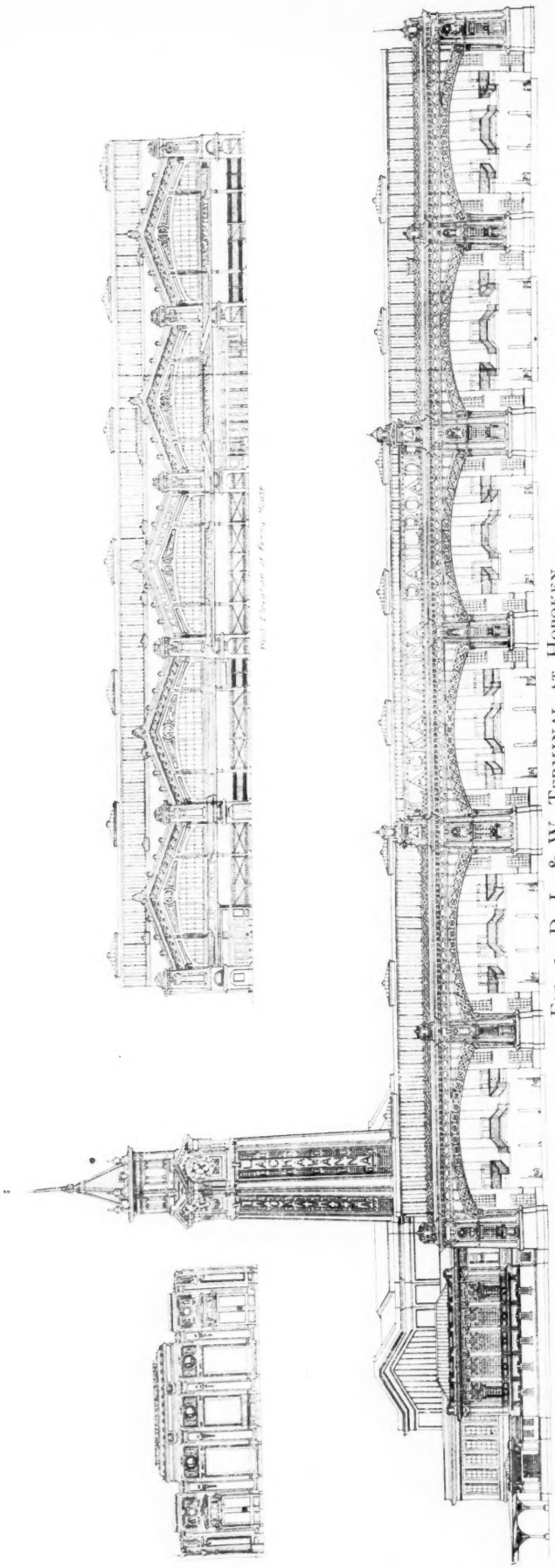


FIG. 3—D. L. & W. TERMINAL AT HOBOKEN.

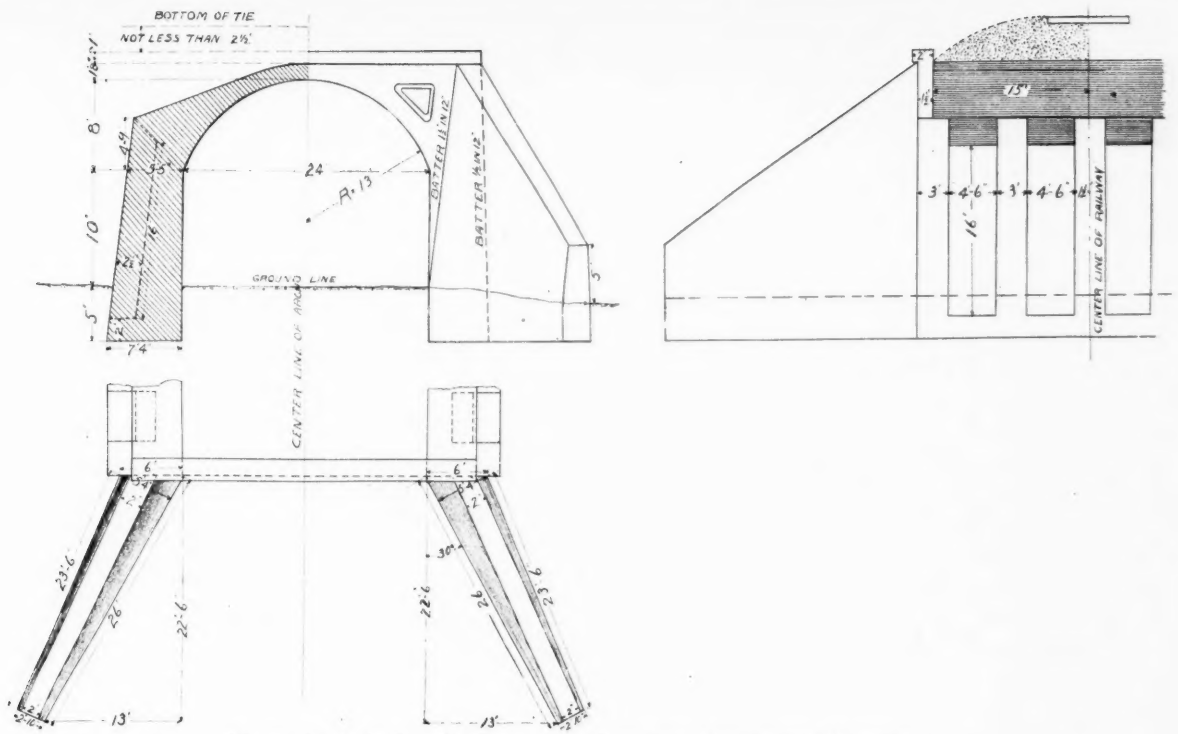
struction, as also those for the Twenty-third street terminal mentioned heretofore, and will supervise the present construction.

The interior finish of the waiting rooms and restaurant will be of the popular molded plaster, which lends itself so readily to artistic effects. In woods such as are used, quartered white oak will be found in the ascendent, while cherry has been selected for the restaurant. Ash and yellow pine are used in the offices, while window frames and sashes are to be of white pine, except in special locations to safeguard against fire, when copper window frames and wired glass will be used. Maple is selected for all finished wood floors. Concrete is to be largely used for treads of stairways, which will also have the Mason safety tread. The floors will have for a finish in special cases, matting, rubber tile, granolithic, mosaic and terrazo, the two latter being selected for the waiting rooms, while the two former will be laid on the inclined plane leading to and from the upper decks of the boats. The rubber tile will be furnished by the New York Belting and Packing Co.

A wide concourse will communicate with the upper decks of the ferry boats in the slips, and will be of a size to handle 30,000 people with ease. When leaving the ferry boats, passengers may pass at once to the trains by another concourse to the tracks which will occupy the original level. On taking the boats, passengers may ascend to the upper deck either by an inclined plane, by stairs or by the elevator, as they prefer. The complete structure will be 600 ft. long on the river, and have a tower 225 ft. high in which will be a clock and the whole illuminated by electricity, bringing into prominence both on the tower and river front of the building, the name of the road in electric bulbs. In connection with this lighting system, which is made up of small incandescent bulbs arranged closely together, it is schemed for the purpose of not only concentration, but also for the soft shadowless effect produced, which, while accentuating the inside finish, will also give a most pleasing and restful illumination.

New Cut Off For The Erie

IN compliance with the determination of the Erie officials to cut down grades to lowest possible limit, arrangements have been perfected to take up this work on the third of the proposed systems of cut-off. This will mean the construction of a single track line paralleling the main line between Lakewood, N. Y., at the foot of Chautauqua Lake, westward to Watts Platts, fifteen miles. From that point west to Columbus, Pa., ten miles, a double track line will be built to take the place of the present main line, reducing a thirty-five grade to a 0.2 per cent grade. The improvement will cost approximately $1,000,000, and the work is taken up at this time in order to obviate some of the troubles of winter traffic. This will give the Erie a double track the entire distance between Kennedy, ten miles east of Jamestown, and Corry, Pa.



M. St. P. & S. Ste. M. Ry. 24-ft. Concrete Arch for Highway.

Plain Concrete Arch Construction, M. St. P. & S. S. M. Ry.

A CONCRETE arch carrying the track of the Soo line over a highway, is here illustrated by permission of Chief Engineer Greers of that road. This arch is of plain concrete construction of 24 ft. clear span, and a height of 18 ft. at the center of the arch, which is curved to a radius of 13 ft. The pockets shown at the earth side of the walls are 54 ins. wide and 30 ins. deep extending to the spring line; there being four of these simply for the purpose of reducing the amount of concrete where not needed, since the omission is compensated for by the filling. The arch is 18 ins. deep at the crown, while the top faces of the portals form a parapet 24 ins. wide and 12 ins. deep. From the top of the crown to the bottom of the ties there is 42 ins. of earth and ballast. The whole construction is in line with the policy of modern engineers to use concrete in lieu of the more expensive stone wherever the exigencies of the case will permit, and is a good example of what is going on in that direction, by a road that is alive to the necessity of having nothing but the best in the maintenance of its way.

Change in Engineering Jurisdiction, New York Central

BY the resignation of Mr. H. Fernstrom, chief engineer of the New York Central, construction work will be divided into two zones, each in charge of a principal assistant engineer. The electric zone consists of the main lines of the Hudson and Harlem division between the Grand Central station, New York City, and Croton and White Plains. This zone will be in charge of Principal Assistant Engineer Warren H. Knowlton and an assistant, for all maintenance and construction work, with the exception of electrical and mechanical work under the electrical engineer and of buildings under the associated architects. Mr. Knowlton will have sole jurisdiction over the terminal and resident engineers and superintendents of construction.

That portion of the line not embraced in the limits of the Electric Zone is disignated the Exterior Zone. Principal Assistant Charles J. Parker aided by an assistant will have charge of all maintenance and construction within the following limits: Schenectady Improvement, Utica Improvement, Auburn Improvement, Buffalo Crossing Improvement, Elimination of Grade Crossings —Exterior Zone, Revisions and Improvements in Grades and Alignment, New Lines and Branches, Double Tracking, News Items that will be specially designated from time to time.

The principal assistant engineer will have sole jurisdiction over the locating engineer, resident engineers, architect and mechanical engineer, and over the engineer of maintenance of way on portions of the line designated. The designing engineers of the Electric and Exterior Zone, bridge engineer, office engineer and signal engineer, will report direct to Vice-President Wilgus, and to the principal assistant engineers on their respective territories as to the preparation of contracts, plans, specifications, estimates and right of way records.

Results of Cement Tests

THE effect of the time element on the strength of cement, while generally understood to increase its value for tensile and crushing resistance, the rate of increase by weeks, months or years is usually a sealed book to all except the expert who is privileged to make tests that yield that kind of information, and this is also true of the proportions of mortar and sand entering into the test blocks. It is needless to expatiate on the immense advantages going with a familiarity with the performance of different cements under time tests, since they are patent to all who use this magic material that is already supplanting stone in engineering.

By the courtesy of Mr. N. G. Rhodes, the city cement inspector of St. Paul, Minn., we present the results of

TABLE NO.1 PORTLAND CEMENT TESTS 1904 - NEAT

Time in Days	Ovil		Marquette		Atlas		A.B. Chicago		Alpena		Universal		Nedving		Alpha		Saylor		North Hamaton		Wolverine		Vulcanite		Hercules		Scales		Silexoid		Totals
	No. of Tests	Average	No. of Tests	Average	No. of Tests	Average	No. of Tests	Average	No. of Tests	Average	No. of Tests	Average	No. of Tests	Average	No. of Tests	Average	No. of Tests	Average	No. of Tests	Average	No. of Tests	Average	No. of Tests	Average	No. of Tests	Average	No. of Tests	Average	No. of Tests	Average	
1	275	380	140	411	95	439	5	507	25	519	45	360	45	435	5	449	5	422	5	489	5	398	15	345	5	363	5	407	5	297	
7	210	733	110	693	85	699	5	723	20	848	50	707	45	787	5	1032	5	642	5	668	5	651	15	861	5	526	5	539	5	577	
30	115	832	40	744	30	738	5	863	15	788	40	790	15	872	5	890	5	888	5	774	5	645	10	983	5	594			5	614	
60	70	850	40	853	25	746	5	900	15	765	35	788	10	719	5	933	5	928	5	932									5	672	
90	35	886	30	859	25	799	5	910	5	937	15	839			5	690	5	971													
180	30	905	15	823	10	855	5	920	5	920							5	1095													
365	10	987	25	822	5	734	5	998	5	868							5	912													
730	5	1011	5	987																											
	690		405		275		35		90		185		115		25		35		20		15		40		15		10		20		1975

MORTAR PROPORTION 1-3 STANDARD SAND

1	11	92					5	99	5	188																				
7	100	262	35	219	5	220	5	244	5	295	5	249	96	259	5	316			5	171					5	197	5	268	5	156	
30	30	319	5	356	5	360	5	382	5	229	5	326	25	382	5	463													5	210	
60	25	406					5	416					10	413															5	322	
90	10	450					5	446					5	511																	
180	15	569					5	569					5	532																	
365	10	564					5	662					5	577																	
	201		40		10		35		15		10		140		10				5						5		5		15		491

TESTS IN PROGRESS 1145 - PORTLAND 1975 - MORTAR 491 - TOTALS 3611

TABLE NO.2 NATURAL CEMENT TESTS 1904 NEAT

Time in Days	Milwaukee		Austin		Mankato		Utica		Louisville		Totals
	No. of Tests	Average	No. of Tests	Average	No. of Tests	Average	No. of Tests	Average	No. of Tests	Average	
1	200	147	300	120	75	115	75	148	55	165	
7	195	166	220	128	50	142	55	236	35	157	
30	95	269	130	231	75	275	40	303	20	267	
60	85	326	80	344	50	307	60	312	30	356	
90	50	365	85	381	40	338	30	326	15	417	
180	30	390	45	387	30	374	30	361	15	321	
365	65	366	50	392	40	376	40	314	10	479	
730	10	420	5	526	5	344	5	419	10	496	
TOTAL	730		915		365		335		190		2535

MORTAR PROPORTION 1-2 STANDARD SAND

7	5	138	5	117	5	95	5	170			
30	5	256	5	253	5	179	5	244			
60	5	286	5	308	5	230	5	258			
90	5	304	5	319	5	236	5	263			
180	5	317	5	359	5	218	5	268			
365	5	340	5	393	5	298	5	311			
	30		30		30		30				120

TESTS IN PROGRESS 910 NATURAL 2535 - MORTAR 120 - TOTALS 3565

some tests made by him on various neat cements, covering periods of age in the test specimens of one day, one week, one month, two months, three months, six months, one year and two years, as shown in Table No. 1, the tests being made during 1904, and include a total of 1,975. The lower portion of this table gives the mortar tests, of proportion 1:3 standard sand, which are carried through the same periods up to one year as the cement. The respective strengths are read in the columns of averages. In Table No. 2 is another series of tests made over the same range of age, but with natural cements. Under this table is arranged the tests of mortar of proportion 1:2 standard sand.

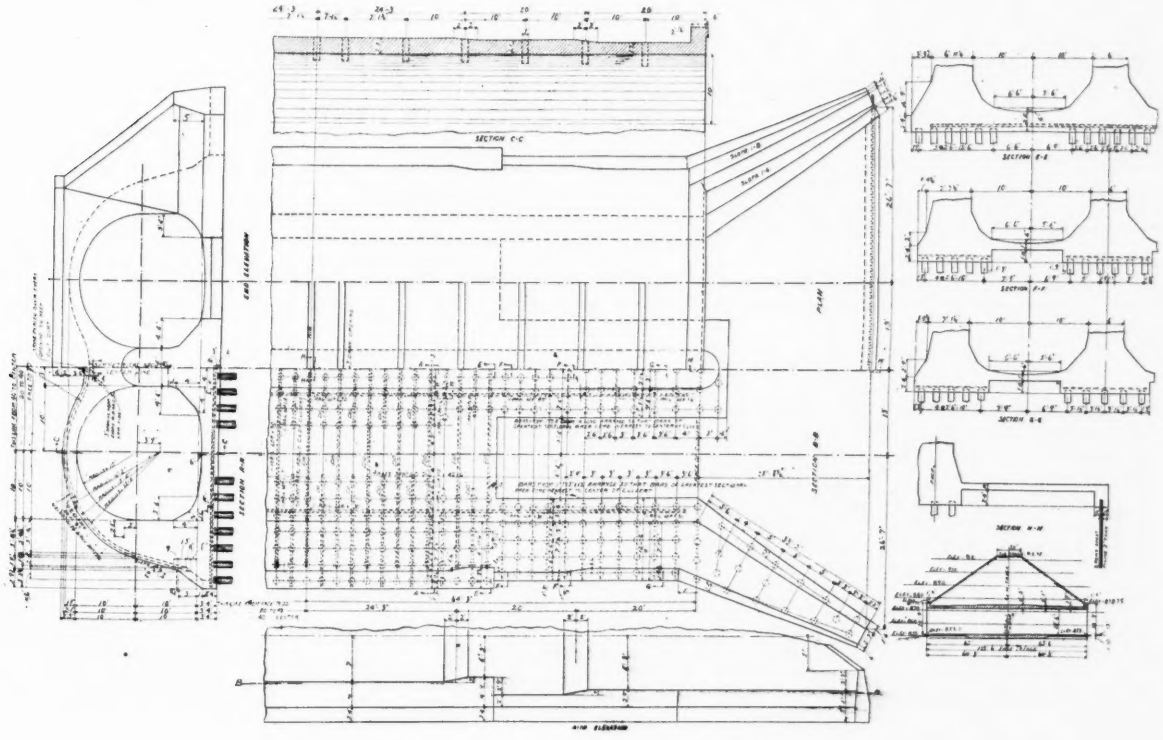
These tables are peculiarly valuable by reason of the pains-taking labor of Mr. Rhodes to get accurate results, and also on account of the reliable instruments and accessories in the testing laboratory, as well as the long experience in this class of work by the experimenter.

Double 20-ft. Concrete Culvert -- Chicago Great Western Ry.

THE double concrete culvert on the C. G. W. Ry., shown herewith, comes within the meaning of the term good work, being of the highest character of stability due to its foundation of piling and also to its reinforcement at points requiring it, as well as the excellent quality of work going into its construction. The twin bores are 20 ft. wide and 20 ft. 6 ins. high; the curves of the arch being of 10 ft. radius, the arch is a complete semi-circle. The piles are spaced at 30 ins. centers and are disposed under the arches at points receiving the maximum load, throughout their total length of 128 ft. 6 ins.

The reinforcement at the base consists of T-rails set transversely over the piles, and in addition to these there are T-rails running longitudinally, above those just mentioned and placed practically under the inside walls of the arch. Besides these there are also two running in the same direction, between the arches and near the top, and one at the outside arch walls near the spring line. By the terms of the specifications, all rails must be spliced with two fish bars and four bolts at every joint, and all joints above the center wall must be staggered. The rails used are 60 lb. The transverse reinforcement by means of T-rails is through the central section only, there being a distance of about 33 ft. from each end, which has a series of round bars of one and two inches diameter, the larger of which are placed nearest the center of the culverts. These bars are not continuous, however, and like the rails are placed above the center line of the piles, but not in contact with them.

The thorough pains given to insure correct work is also shown in the specification which says with reference to the reinforcement, that all metal must be fully imbedded in mortar, and care must be taken that the metal has a perfect bearing in mortar throughout its full length. The longitudinal section at a reduced scale shows the varying thickness of concrete at the roof and bottom, also the earthwork and slope of same to the track level. We are indebted to Chief Engineer Munster, of the above road, whose design this is, for the prints from which our illustrations are made.

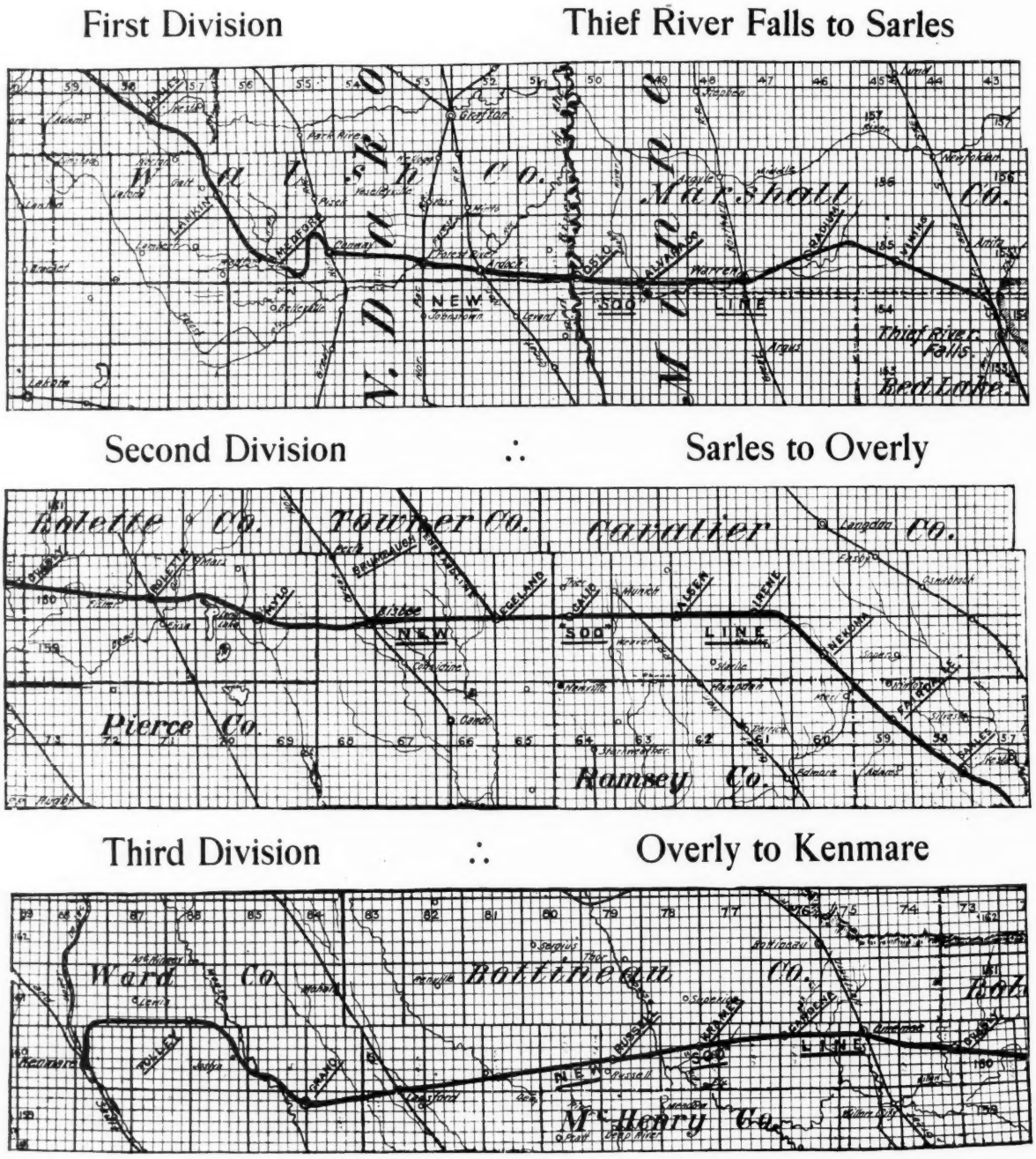


DOUBLE 20-FT. CONCRETE CULVERT, C. G. W. RY.

Improvements on the Soo Line

EXTENSIVE improvements have been under way for some time on the M. St. P & S. S. M. Ry., and new ones are being projected by Chief Engineer Green, that will change the physical characteristics of that line to the extent of making it one of the most prominent factors in freight haulage. Among the heavy structural propositions is a new bridge over the Mississippi at Camden Place, Minneapolis. This bridge is a seven-span, single-track, latticed-deck girder. Six of the spans are 110 ft. long and one 125 ft. long, and will rest on concrete piers built under the rigors of a Minnesota winter. The bridge was built by the Minneapolis Steel & Machinery Company, and will be erected by Franklin Bros. & Morse; the date of completion is September 1. For renewal purposes there are three deck girder spans over the Jones river.

The new line extends from Thief River Falls, on the Winnipeg line in northern Minnesota, west through to Kenmare on the main line in northeast North Dakota, for a distance of 300 miles. This improvement shown on the map herewith was commenced this spring and is to be finished this fall. There is now about 80 miles of steel laid, and the remainder is going down at a rapid



MAP OF THE NEW SOO LINE.

rate by means of the Roberts track laying machine. In addition to this extension from Thief River Falls, there is another one being projected into Towner county, a distance of 23 miles, which will also be completed this fall. The Underwood extension north of Bismarck, which will be about 20 miles long, will also be completed during September.

Revision of grades is going on between Eden Valley and Painesville, Minn., by which the grades will be cut from 0.8 per cent to 0.3 per cent, while the whole of the main line from the Minnesota state line will also be reduced to 0.3 per cent. These grade revisions will make the Soo an ideal line for heavy freight service, when considered in connection with the fact that a 3 degree curve is maximum on that line, and only one as high as that, which is located at Kenmare. A study of the map reveals some beautifully long tangents. This line operates through one of the richest and most productive wheat belts in the world and will, with these improvements completed, be in a position to handle all the business coming its way.

New York Central Improvements

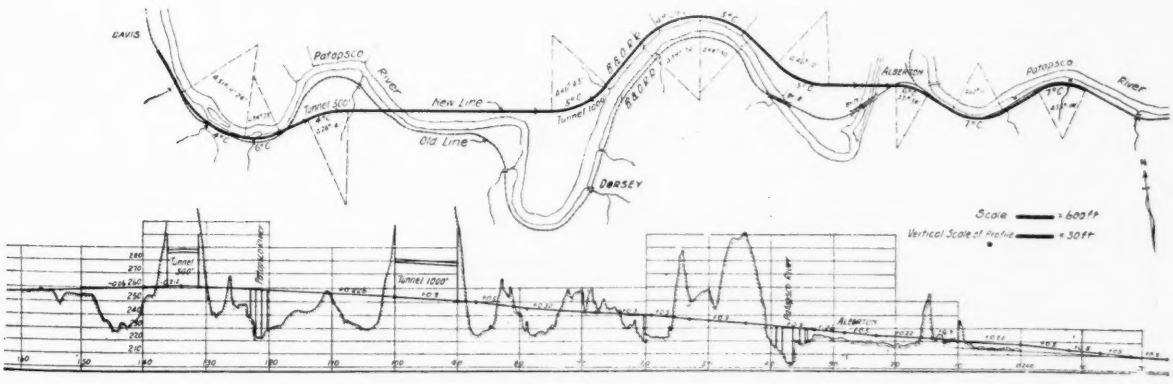
THE engineering improvements under execution at this time on the New York Central, outside and apart from the prodigious terminal scheme in New York City, are more extensive than any ever before in hand at one time, in the history of the road. In the Gravity yard at DeWitt, which is one of the largest car distributing points as it stands, there is to be an addition of 16 miles of trackage. At Schenectady, the work of elevating the tracks above the streets, is well under way, involving some smooth engineering, particularly with the skewbridge over the Erie canal west of the station. State street, which is the principal business thoroughfare, has always been a dangerous crossing, and its elimination will be one of the best things ever done for the city. The new station, which will be on the site of the old one, will bear a close resemblance in its relation to the elevated tracks to that at Albany, being on the street level, while the tracks are above.

Improvements of Line on the Baltimore and Ohio

IMPROVEMENTS of more than ordinary magnitude are contemplated on the main line of the B. & O., which, when completed on the basis outlined, will really make a new road between Hollofields and Alberton, since the original location will have been quite abandoned. This work involves the construction of two tunnels of a length of 500 and 1,000 feet, respectively, and will also cut out 542 degrees of curvature, by which the distance will be reduced about 3,500 feet. The maximum curve will be 7 degrees, due to the eliminating process, which was sorely needed, as this section of the road was noted for sharp curves, both of the single and reverse types.

This departure from the old road bed will also result in a reduction of gradients for west-bound haulage from 0.9 per cent to 0.5 per cent, which will effect a saving in operation fully as important as that of curve elimination. Our illustration gives a plan and profile of the old and new line, the former following the winding Patapsco river, while the new location is projected with the view of having something like a tangent in its alignment. Though about two millions of dollars have been used heretofore in grade improvement from Washington Junction to Relay, the present outlay is intended to complete and perfect those improvements.

In addition to the above, there is to be an extension of the double track for a distance of four miles between Germantown and Gaithersburg, and for two miles between Dickerson and Barnesville. The cost of this work will be about $600,000. Curve elimination and grade reduction will also be the order between Brown's Station and Clopper, which work will also shorten the mileage. Not the least of the expense of these betterments will be found in the replacing of modern bridges and trestles with stone structures. The modern trestle over the little Monocacy creek, near Barnesville, will be supplanted by a stone viaduct having three nine-foot arches, and the wooden trestle over Big Seneca creek, which is 400 feet long and 90 feet high, will be replaced by a stone bridge having three arches of 65 feet span.



IMPROVEMENTS OF THE B. & O. R. R. BETWEEN ALBERTON AND DAVIS.

Sand Houses and Appliances---II

THE general arrangement and equipment of the Chicago, Milwaukee & St. Paul sanding appartus is shown in Fig. 1, 2, 3 and 4. Figure 1 is the plan of the drying room, which has two stoves and a rotary dryer. The sand is shoveled from cars in to the storage bin, from which it is shoveled either into the rotary dryer or sand stoves. The stoves are installed only for emergency uses and at points where power cannot be obtained conveniently. Figure 3 shows the rotary dryer in detail. It consists of a cylinder two feet three and a half inches diameter and seventeen feet five inches long. At each end is a ring with flanges shaped like a car wheel tire. These rings rest on roller bearings, one end being higher than the other. At the lower end is a 5x5 mesh No. 14 wire screen to separate the gravel and sand. The greater part of the cylinder passes through a stove. An electric motor revolves the cylinder which brings all of the sand in contact with the hot metal, drying it as it passes to the lower level. When it gets to the lower end it is perfectly dry and drops through the screen into the sand reservoir below, while the gravel drops out at the end into a box.

From the reservoir the sand is elevated to the tower shown in Fig. 2 by means of air pressure.

The stoves used at some points are shown in Fig. 4. These do not differ much from other stoves for the same kind of service with the exception that the hopper has holes at frequent intervals for loosening sand as it bakes in.

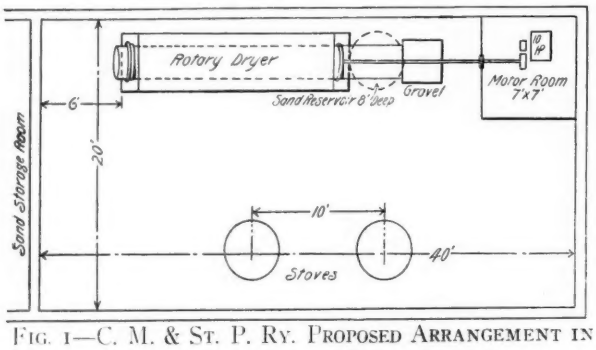


FIG. 1—C. M. & ST. P. RY. PROPOSED ARRANGEMENT IN SAND DRYING ROOM.

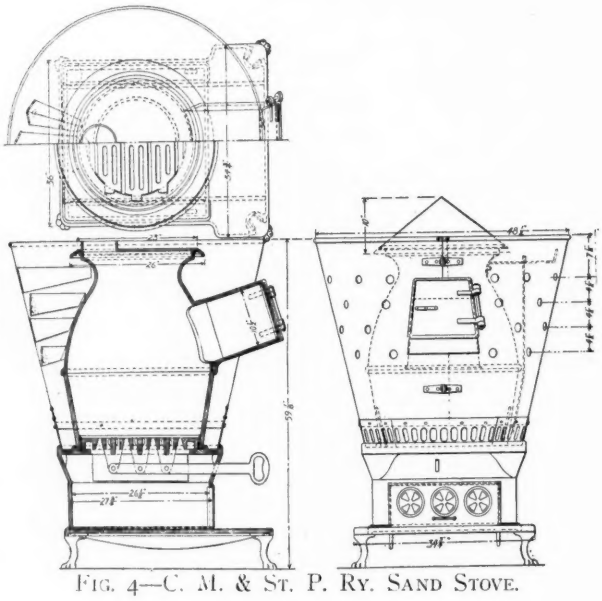


FIG. 4—C. M. & ST. P. RY. SAND STOVE.

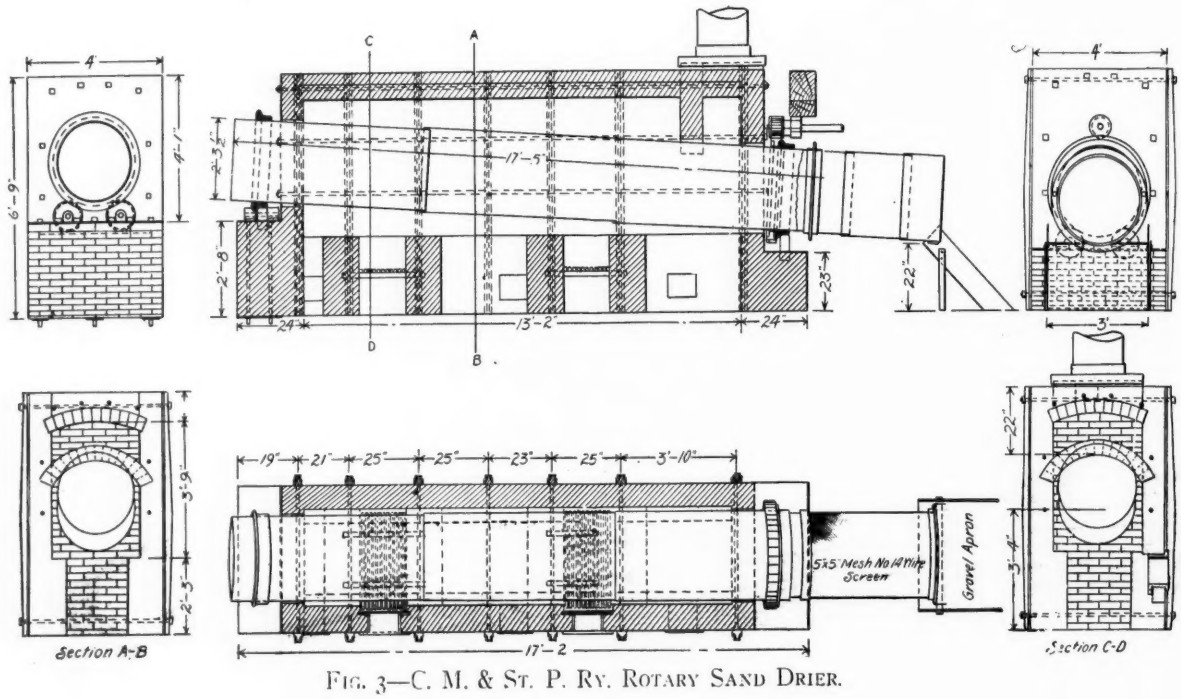


FIG. 3—C. M. & ST. P. RY. ROTARY SAND DRIER.

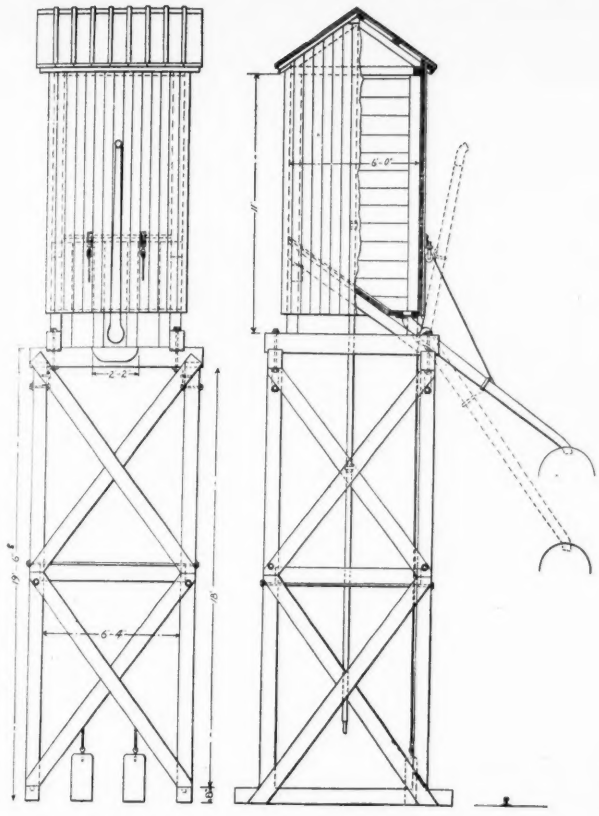


FIG. 2—C. M. & ST. P. RY. ELEVATION OF STORAGE BIN.

We are indebted to Mr. J. F. De Voy, M. E., for the above illustrations and descriptions.

The arrangement of the Vandalia Railroad sanding apparatus is shown in Figs. 5 and 6. Figure 5 gives the side and end elevation. There is a wet sand storage capacity of 3,080 cubic feet which is shoveled from cars through openings in the side. From this it is shoveled into stoves, whose capacity is 220 cubic feet in 24 hours, to dry, after which it is thrown on a screen above the hopper connected with the elevating reservoir. The elevating reservoir is shown in Fig. 6. The valve of this works as follows: The air in the reservoir and cylinder X is exhausted through a three-way cock by means of pipes C and F. This allows the spring B to force down the piston and open valve A, allowing sand to fill the reservoir. The three-way cock then admits air into pipes C and F again, which closes the valve A and puts a pressure in the reservoir. There is no storage

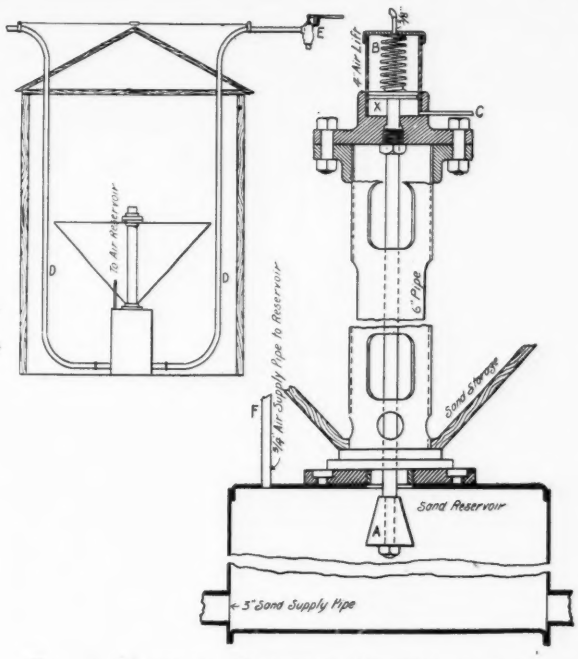


FIG. 6—VANDALIA RAILROAD AUTOMATIC SAND ELEVATOR.

tank in connection with the plant, but as sand is needed the valve E is opened which fills the sand box on the locomotive directly.

We are indebted to Mr. W. C. Arp, S. M. P., for the drawings and description.

The method and equipment for handling the sand on the Pittsburg & Lake Erie is shown in Figs. 7, 8 and 9. Figure 7 shows the plan and elevation with all the equipment. The sand is brought into the house on an inclined track, after which it is dumped and shoveled into the wet storage bin, which has a capacity of 55 cars, and is shown in detail in Figs. 8 and 9. From the wet storage bin it is taken in a bucket elevator to the stoves located above a large hopper. As the sand dries it drops into the hopper, is screened and then carried up on the belt carriage by means of another bucket elevator. The belt takes it across several tracks to the storage bin from which the locomotives are sanded. The motor for driving the machinery is located above the stoves.

We are indebted to Mr. L. H. Turner, S. M. P., for the above illustrations and description.

The Minneapolis & St. Louis Railroad Company's sand house is shown in Figs. 10 and 11. Figure 10 gives the

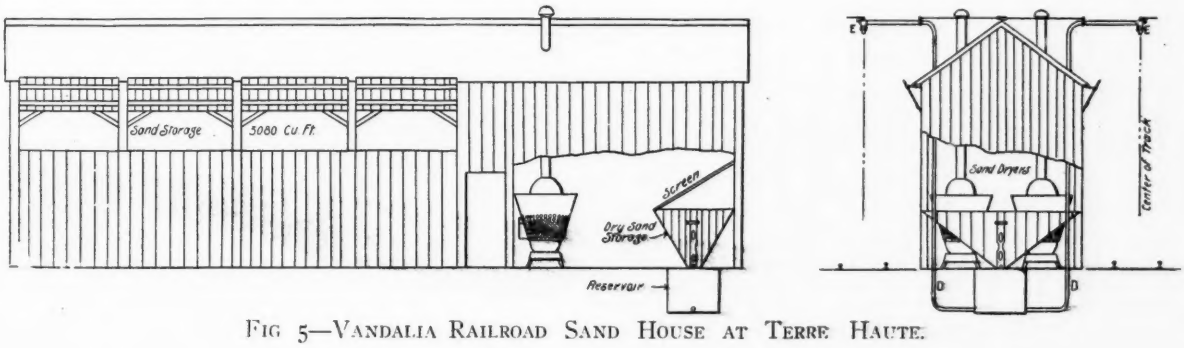


FIG 5—VANDALIA RAILROAD SAND HOUSE AT TERRE HAUTE.

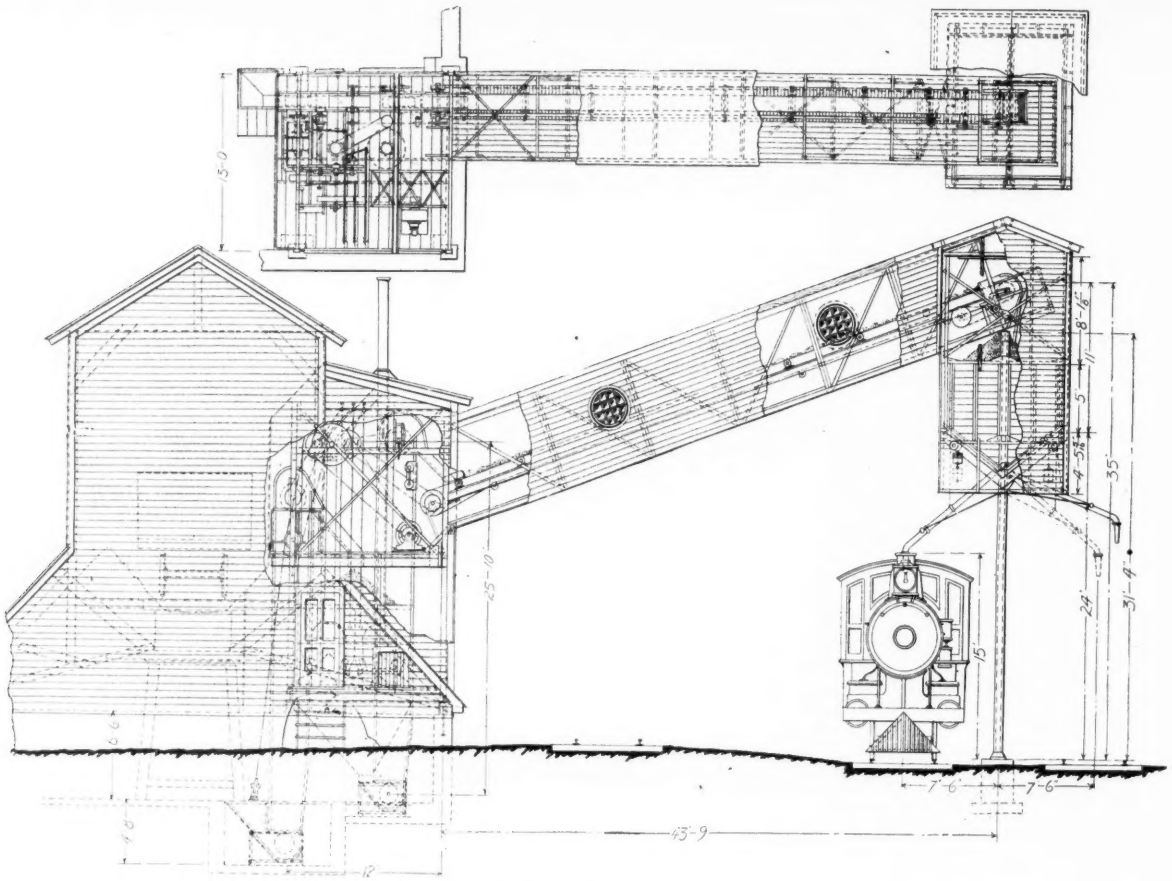


FIG. 7—P. & L. E. SAND HOUSE AT MCKEES ROCKS.

plan, elevation and a partial section. The house is divided into the wet sand room, operating room and storage shown in Fig. 13. The sand is dumped directly into the stoves, after which it is shoveled into the rotary screen, shown in detail in Fig. 11. This screen is operated by means of an air motor and drops the sand into a hopper above the elevating drum. The sand is then elevated by means of air pressure to the storage tank, from which it is supplied to the locomotive.

We are indebted to Mr. John Tonge for the illustrations and description.

In handling the sand on the Terminal Railroad Association of St. Louis, loaded cars are run up the incline shown in Fig. 13. The sand is dumped directly into the storage bins from the cars as shown in Fig. 12. These bins have a connection above the sand stove, so that it requires no further handling of sand to dry it. After passing through the stoves it is screened and put in the elevating drums, from which it is elevated by air to the dry sand storage bins above.

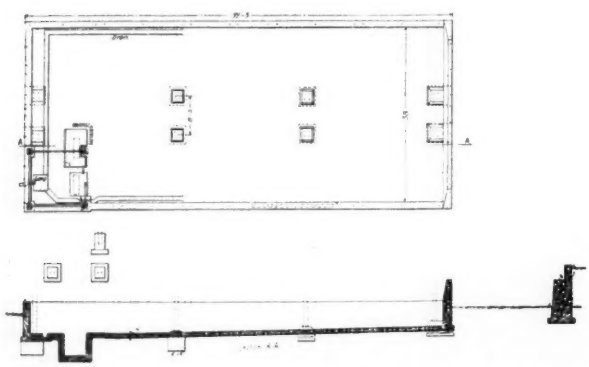


FIG. 8—FOUNDATION PLAN P. & L. E. SAND HOUSE.

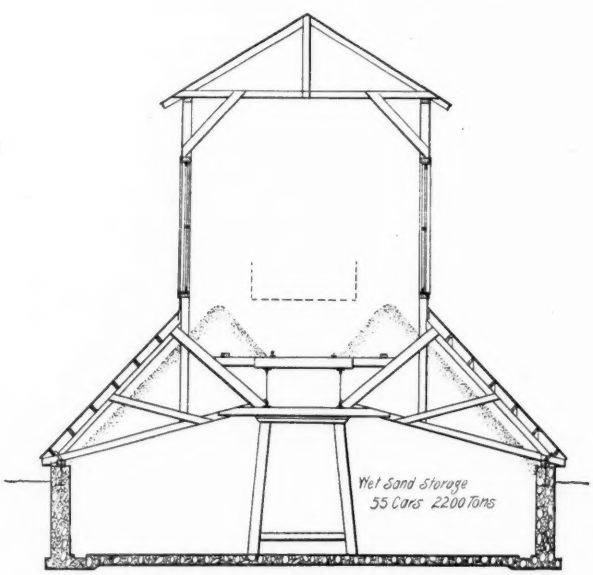


FIG. 9—CROSS SECTION P. & L. E. SAND HOUSE.

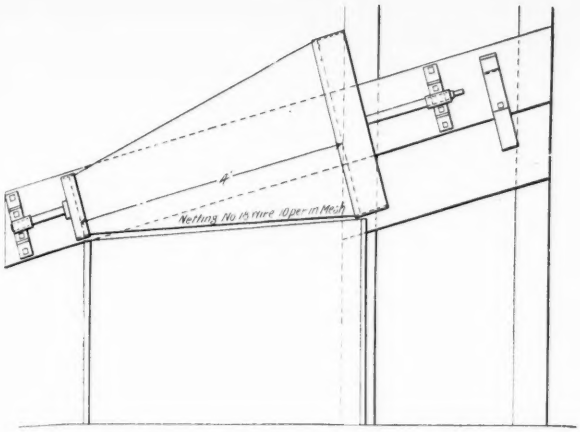
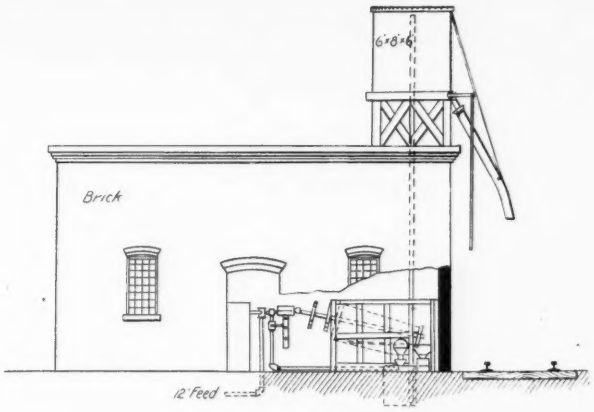


FIG. 11—ROTARY SAND SCREEN M. & ST. L. R. R.

We are indebted to Mr. Wm. Bawden for the above illustrations and description.

The standard sand house of the Pennsylvania Lines West is shown in Fig. 14, which is a plan and elevation of the Kinsman street house in Cleveland. In the sand is dried in a stove, after which it is screened and dropped into the elevating drum. Air pressure elevates it from the drum to an auxiliary drum, and from this to the storage bin in the top of the tower. Four-inch pipes lead down from this storage to the said chutes, from which the locomotives are sanded. A detail of the under-cut gate valve is shown in the illustration.



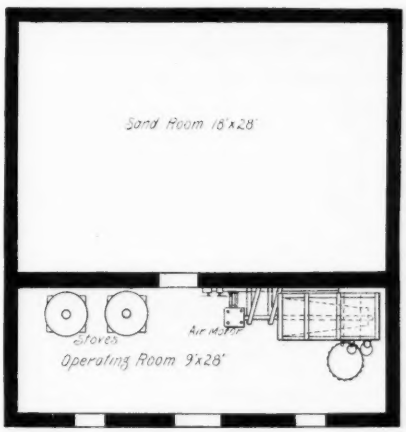
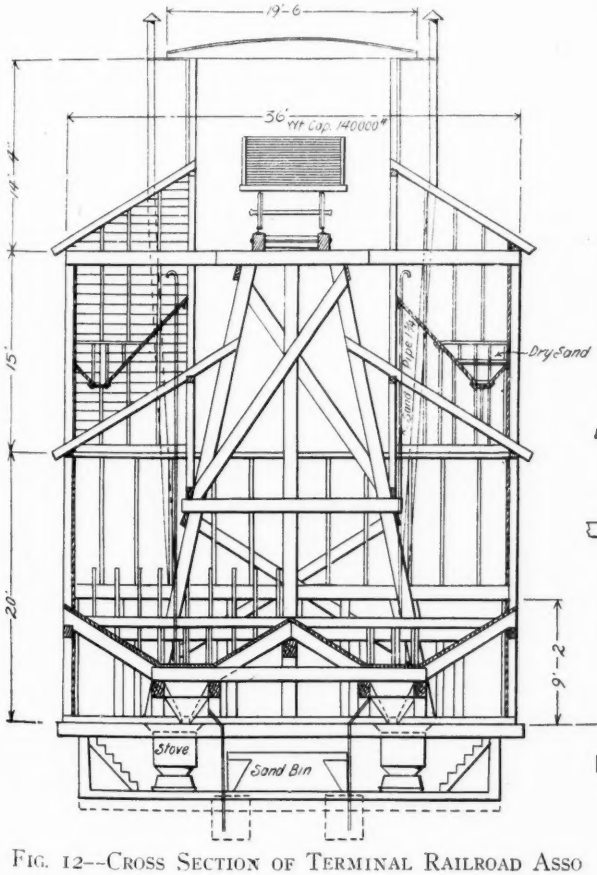


FIG. 10—PLAN AND ELEVATION M. & ST. L. R. R. SAND HOUSE.



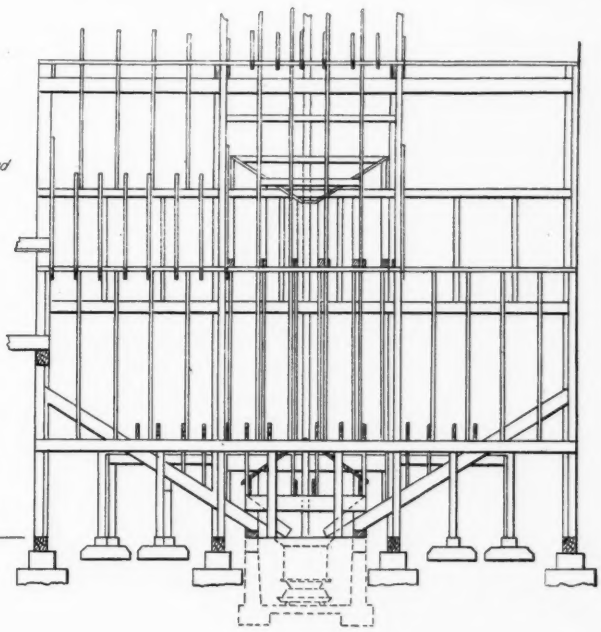


FIG. 12—CROSS SECTION OF TERMINAL RAILROAD ASSOCIATION OF ST. LOUIS SAND HOUSE.

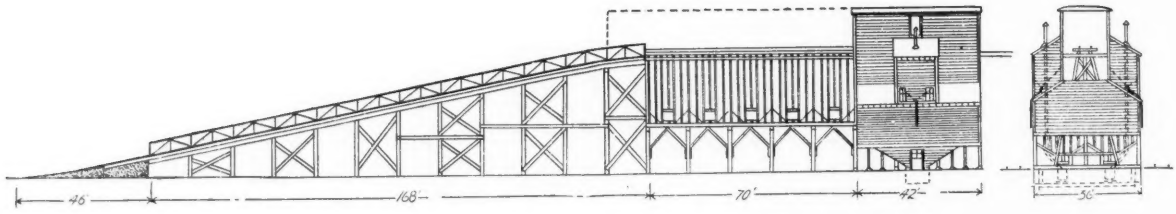


FIG. 13—ELEVATION AND SECTION OF T. R. R. A. OF ST. L. SAND HOUSE.

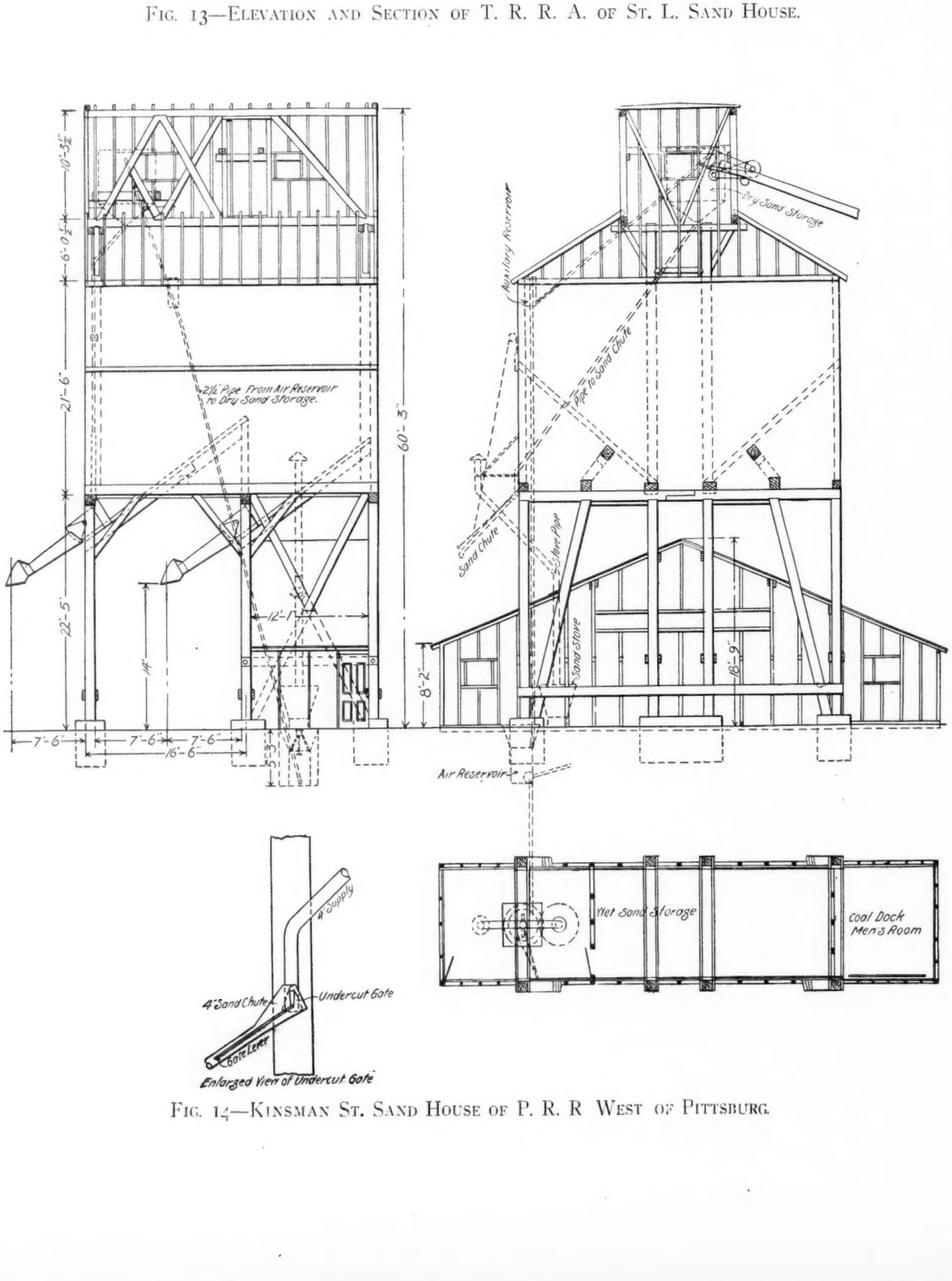


FIG. 14—KINSMAN ST. SAND HOUSE OF P. R. R WEST OF PITTSBURG.

Personals

Mr. W. A. Doane, heretofore city engineer of Meadville, Pa., has been appointed division engineer of the South & Western Railway at Bristol.

Mr. W. R. Sanborn has been appointed assistant engineer of the Indiana, Illinois & Iowa, with office at Kankakee, Ill.

Mr. F. E. Watson, of Albion, Neb., has been appointed assistant engineer of the Isthmian Canal Commission.

Mr. D. Sweeney has been appointed roadmaster of the Missouri, Kansas & Texas at Atoka, I. T., in place of Mr. I. Tabler, resigned.

Mr. R. W. Keenan has been appointed supervisor of the Cleveland, Cincinnati, Chicago & St. Louis at Cairo, Ill.

Mr. E. Fisher, engineer of bridges and buildings of the Missouri Pacific at Pacific, Mo., has resigned.

Mr. E. P. Biddings has been appointed road master of the Houston & Texas Central at Ennis, Texas, to succeed Mr. J. J. Russell, resigned.

Mr. J. C. McClurg has been appointed engineer maintenance of way of the Arizona & Colorado, the Cananea Yaqui & Pacific and Arizona & Eastern, with office at Tucson, Ariz.

Mr. B. H. Bryant, who resigned as chief engineer of the Colorado Midland on Jan. 1, has gone to Brazil, South America, to supervise the construction of a railroad.

Mr. A. C. Butterworth, heretofore maintenance of way inspector of the Wabash at St. Louis, Mo., has been appointed assistant engineer at Chicago, in charge of the construction of the Landers Yard.

Mr. E. F. Vincent, heretofore chief draughtsman of the Missouri Pacific, has been appointed assistant engineer at Saint Louis, Mo., to succeed Mr. F. B. Scheetz, transferred.

The headquarters of Mr. E. Abrahamson, roadmaster of the St. Louis & San Francisco, have been removed from Oklahoma City to Lawton, Okla.

Mr. A. Crable has been appointed division engineer of the Chicago & Erie at Huntington, Ind., vice Mr. F. J. Moser, promoted, effective on August 1.

Mr. N. C. Van Natta has been appointed chief engineer of the Kanawha & West Virginia, with headquarters at Charleston, W. Va., vice Mr. C. P. Peyton, resigned.

Mr. M. A. Hansen, engineer of river protection of the Missouri Pacific, has been appointed chief engineer of the Arkansas Southern, with headquarters at Ruston, La.

Mr. R. C. Duncan has been appointed superintendent of telegraph of the Toledo, St. Louis & Western, with headquarters at Frankfort, Ind., vice Mr. A. W. Early.

Mr. F. F. Harrington, heretofore the assistant to the chief engineer of the New York Central & Hudson River, has been appointed engineer of bridges of the Tidewater Railway, with office at Norfolk, Va.

Mr. A. S. Zinn, principal assistant engineer of the Chicago, Rock Island & Pacific at Oklahoma City, Okla., has been appointed division engineer at that point, to succeed Mr. W. E. Watson, resigned.

Mr. H. F. Koppes has been appointed assistant division engineer of the Monongahela division of the Baltimore & Ohio at Grafton, W. Va., to succeed Mr. W. C. Barrett, who has been transferred to the Newark division at Newark, O.

Mr. A. M. Brooker has been appointed roadmaster of the Northern district of the Chicago, Rock Island & Pacific at Chickasha, I. T., to succeed Mr. C. P. Gibson, who has accepted a position with the Panama Railroad.

Mr. H. Fernstrom has resigned as chief engineer of the New York Central & Hudson River to become chief engineer of the Tidewater Railway, with headquarters at Norfolk, Va., succeeding Mr. C. P. Howard, resigned.

Mr. C. B. Stanton has been appointed superintendent of construction of the extension of the Chicago & Alton between Springfield and Murrayville, Ill., with headquarters at Springfield, Illinois.

Mr. George R. Wadsworth has resigned as resident engineer of the New York Central & Hudson River, to accept a position with J. G. White & Co., of New York, as assistant to the construction manager.

Mr. B. B. Kelliher, heretofore division engineer of the Grand Trunk Pacific at Winnipeg, Man., has been appointed chief engineer of that road and will have charge of the construction of the western section.

Mr. Theo Speiden, Jr., assistant engineer of the Louisville & Nashville at Nashville, Tenn., has been appointed roadmaster at Nashville to succeed Mr. A. J. Lamb, transferred. Mr. M. Clark, heretofore supervisor of tracks, has been appointed assistant roadmaster at Nashville.

Mr. L. G. Morphey, heretofore resident engineer of the New York Central & Hudson River at Buffalo, N. Y., has been appointed assistant to Mr. C. J. Parker, principal assistant engineer at New York.

Mr. F. B. Scheetz, assistant engineer of the Missouri Pacific at St. Louis, Mo., has been appointed chief engineer of bridges and buildings, with headquarters at Saint Louis, Mo., to succeed Mr. E. Fisher, resigned.

Mr. Andrew Maclean has been appointed chief electrician and constructing engineer of the Oregon Railroad & Navigation Company, with office at Portland, Ore. Heretofore Mr. Maclean has been constructing engineer of the Colorado Fuel & Iron Company.

Mr. E. A. Hall, formerly superintendent of the Portland division of the Boston & Maine, has been appointed superintendent of telegraph of the Maine Central, with headquarters at Portland, Maine.

Mr. C. P. Gibson, heretofore roadmaster of the Choctaw district of the Chicago, Rock Island & Pacific at Chickasha, I. T., has been appointed superintendent of the Panama Railroad & Steamship Co., with temporary headquarters at New York.

Mr. Elliott Holbrook, formerly chief engineer of the

Kansas City Southern, has been appointed engineer in charge of the construction of second track of the Chicago & Alton, between Bloomington and Springfield, Ill., effective August 1.

Mr. B. M. McDonald, supervisor of track of the New York Central & Hudson River at Albany, N. Y., has been appointed engineer of the Pennsylvania division at Jersey Shore, Pa., in place of Mr. D. L. Somerville, transferred.

Mr. M. J. Butler, formerly assistant chief engineer of the Canadian Transcontinental Railway Commission, has been appointed deputy minister of railways and chief engineer of canals for the Dominion of Canada, to succeed Mr. Collingwood Schreiber, who has been appointed consulting engineer.

Mr. W. B. Hanlon has resigned as district engineer of the Baltimore & Ohio at Cleveland, O. Mr. A. S. Wordle has been appointed engineer of maintenance of way of the Wheeling division at Wheeling, W. Va., to succeed Mr. J. T. Wilson, who has been transferred to Baltimore, Md.

Mr. F. G. Jonah, terminal engineer of the New Orleans Terminal Company, has been appointed assistant engineer of the St. Louis & San Francisco in charge of the deep water terminals at Chalmette, with headquarters at New Orleans, La., to succeed Mr. E. M. Lisle, resigned.

Mr. C. G. Delo, heretofore division engineer of the Chicago Great Western at Des Moines, Ia., has been transferred to Kansas City, Mo., as engineer of maintenance of way of the western division. Mr. F. A. Peterson has been appointed to succeed Mr. Delo at Des Moines.

The New York Central & Hudson River announces the appointment of Mr. G. A. Berry as assistant to the principal assistant engineer of the electric zone, with headquarters at Grand Station, New York. Mr. C. P. Marsh is appointed bridge engineer, with office at New York, succeeding Mr. G. A. Berry, effective on August 1.

Mr. C. B. Clark, assistant engineer of the Cleveland, Cincinnati, Chicago & St. Louis at Cincinnati, O., has been appointed chief engineer of maintenance of way of that road and the Peoria & Eastern. Mr. Arthur S. More, assistant engineer of the Chicago division, has been appointed engineer of maintenance of way of the Michigan division at Wabash, Ind.

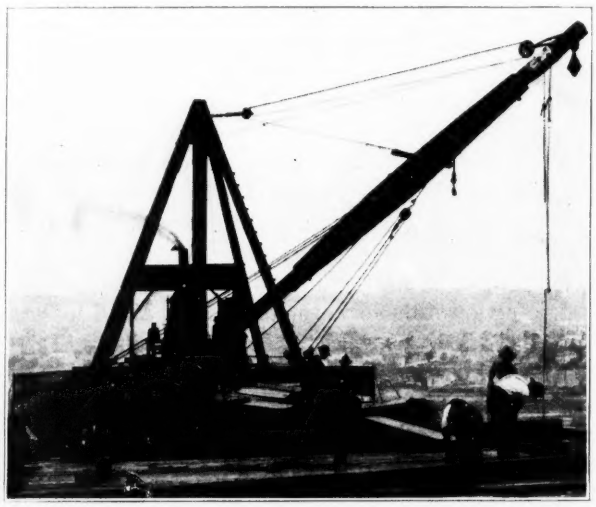
Mr. Frank Lee has been appointed division engineer of the Central Division of the Canadian Pacific R. R., with headquarters at Winnipeg, succeeding Mr. J. E. Schwitzer, transferred. Mr. Lee was formerly with the engineering department of the C. & N. W. Ry., from which service he went to the Canadian Pacific as signal engineer.

Mr. Herbert Murphy has been appointed division engineer of the Missouri Pacific at Kansas City, Mo., in charge of construction of new yards. Mr. J. H. Johnston has been appointed assistant engineer at Nevada, Mo., Mr. S. H. Rusby has been appointed division engineer at Fort Smith, Ark., and Mr. C. H. Cotton has been appointed division engineer at Vidalia, La.

Mr. A. J. Lamb, heretofore roadmaster of the Louisville & Nashville, at Nashville, Tenn., has been transferred to Birmingham, Ala., in a similar capacity, to succeed Mr. W. E. Smith, who has been appointed assistant superintendent in charge of maintenance of way, bridges and buildings of the Birmingham Mineral and Alabama Mineral divisions and the South & North Alabama Railroad, with office at Birmingham.

Bridge Erecting Derrick

The illustration of an erecting derrick herewith, represents a machine built by the American Hoist & Derrick Company, St. Paul, Minn., caught while engaged in putting in two new spans of the high bridge over the Mississippi at St. Paul, which operation was made necessary by the cyclone of one year ago. This derrick is of wooden construction as designed for bridge erecting, and has a boom 50 ft. long, with a capacity of 10,000 lbs. The machine is furnished with a power slewing attachment, and operated by a 7x10 in. double cylinder derrick engine of this company. It has two friction



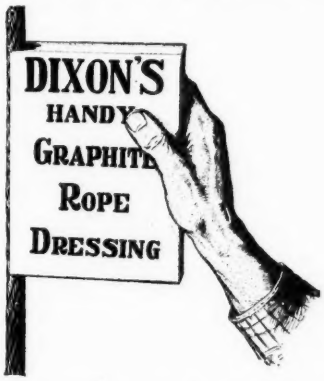
BRIDGE ERECTING DERRICK, AMERICAN HOIST & DERRICK COMPANY.

drums for hoisting, and two reversing drums for slewing, the latter attachment enabling a reduction of two men in the operating crew, and is, therefore, a feature that cannot be dispensed with if economy is considered. These derricks are also largely used for dredging and excavating, by using orange peel buckets, which fact has earned for them the name of being in a class by themselves for railroad and contractor's work. The all steel boom derricks built by this company for yard and platform purposes are also specially adapted to the purposes for which they were designed, having an enormous strength for the material in them, and it is claimed they will reach farther and lift more than any other device of the kind in use. One of these, which is electrically driven and in service on the Pennsylvania road in Chicago, is of 40,000 lbs. capacity.

Wire Rope Lubrication

Elevator and other cables used for hoisting purposes are subject to both internal and external wear; the former is caused by the rubbing of the wires and strands upon one another under pressure in bending over the sheaves, the latter by rubbing and wedging in the grooves of the pulleys.

Unless the cables are kept well lubricated they wear and deteriorate rapidly. As a lubricant for wire rope Dixon's Ticonderoga Flake Graphite has the endorsement of the leading manufacturers as well as the approval of those experienced in its use, because of the well recognized fact that flake graphite preaents the abrasion and wear of all parts coated with it. For this purpose graphite must be combined with suitable greases to make it adhere, but there has always been considerable danger and difficulty in applying grease to moving cables.



Dixon's Handy Graphite Rope Dressing supplies the ideal qualities of Dixon's Flake Graphite as a wire rope lubricant in such a form as to make it thoroughly acceptable to practical men who have used it. The package is of about the size and shape of an ordinary book and contains nearly three pounds of graphite lubricant. It is easily applied by holding the open edge of the package against the cable while in motion.

There is no trouble and no danger to the workman, no waste nor dripping off of lubricant. The economy and efficiency of Dixon's Handy Graphite Rope Dressing, in prolonging the life of wire rope and saving the expense of frequent renewals of worn cables, should commend it to the careful attention of every firm operating hoists or elevators.

For prices and full particulars address the makers, the Joseph Dixon Crucible Co., Jersey City, N. J.

Dependable Hydraulic Jacks

Unless a hydraulic jack is absolutely reliable, the engineer, mechanic, railroad man or whoever is using it is better without it. Just at the critical moment, when everything depends on a jack "standing up," a poorly made device is liable to give way. The consequences are best left to the imagination, they are not pleasant even to imagine. In the Watson-Stillman hydraulic jacks, every such element of uncertainty is eliminated, hence the confidence reposed in them by those who have to trust life and limb to the dependability of a hydraulic jack. The cylinders and rams for which, in some makes, so-called seamless tubing is thought good enough, are in the Watson-Stillman jacks forged from solid steel billets, forged and bored like the cylinder of a high-class steam engine. Valves, glands, pistons, etc., are made and finished with equal care, packings and other parts subject to wear are easily accessible and replacable, the result being a hydraulic jack so thoroughly dependable and constantly ready for service that it holds first place among this class of tools. The manufacturers, Watson-Stillman Co., 46 Dey street, New York, have a list of about 300 styles of hydraulic jacks, which they will send on request.

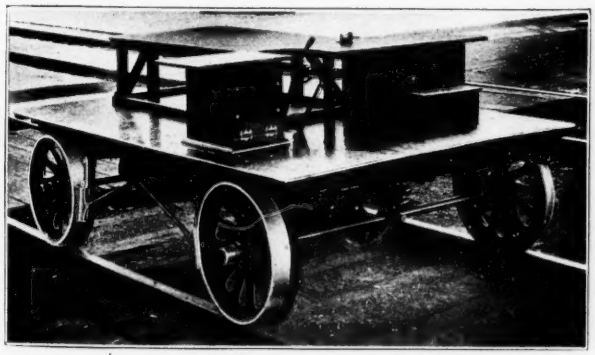
Oldsmobile Section and Extra Gang Motor Works Car

There is now being exhibited in Chicago a new type of gasoline motor work car for railroad use which has attracted great attention from the operating officials of many of the important railroad systems.

The illustrations herewith show the adaptability of this car not only for carrying a considerable number of men required for section and special work purposes, but also its capability of handling rails, tools and material.

The mechanism of this car is unique in several particulars. The car is equipped with a two-cylinder eight-horse power gasoline engine, mounted on a rigid frame, constructed of steel tubing, giving the greatest strength with the minimum weight and rendering the car free from vibration. This construction also insures the greatest durability in service. The transmission on this car is so arranged as to give the same speed forward and back so that the car can be operated with an equal facility in either direction without being turned. This is an advantage not possessed by any other type of car heretofore produced. Another feature that is novel in this type of car is the displacing of the ordinary water cooling system by the substitution of the air cooled principle rendering the car equally serviceable winter or summer.

The car is equipped with double hub brake insuring the quick control and stopping of the car under all circumstances. The engine and propelling machinery is so designed that it can be built for any gauge from 24 ins. upwards. One point that evidently has been kept carefully in mind by the de-



OLDSMOBILE SECTION AND EXTRA GANG MOTOR CAR.

signers has been the necessity for producing a car capable of being safely and successfully operated by any person unskilled in the operation of gasoline motors, the control being very simple and easily handled.

The managing officials of railroads are alive to the economic possibilities of developments along this line. The subject has been discussed very freely during the past year or two both before the Engineering and Roadmasters' convention and through the various railway journals; progress in this direction will be welcomed by the railway officials in the whole country.

This car is built by the Olds Motor Works and is sold by the Railway Appliances Company, Old Colony building, Chicago, who are the sole selling agents in the United States for the various types of railroad cars that are manufactured by the Olds Motor Works.

Notes of the Month

Mr. Frederick Schuchman, president and general manager of the Homestead Valve Manufacturing Company, died on Tuesday, July 25, at Homestead, Pa.

Mr. Chas. Parsons, well known in the pneumatic tool business, is now associated with the Independent Pneumatic Tool Company and will travel out of Chicago.

William T. Simpson, formerly with Detroit Lubricating Company, and more recently with the American Locomotive Equpiment Company, has accepted a position with S. F. Bowser & Company, of Fort Wayne, Ind., manufacturers of the Bowser oil storage systems and oil house equipments.

Mr. G. M. Basford, for the past eight years editor of the American Engineer & Railroad Journal, has accepted a position with the American Locomotive Company in charge of a newly established department of publicity. He will assume his new duties Oct. 1, at the general offices of the company, 111 Broadway, New York.

Since the Independent Pneumatic Tool Company of Chicago have acquired the Aurora Automatic Machinery Company they have received an unusually large number of orders for "Thor" piston air drills, reversible wood boring, reaming, tapping and flue rolling machines, and pneumatic chipping, calking, beading and riveting hammers from railroads, foundries, ship yards, boiler shops and other industrial works.

Sealed proposals will be received at the office of the Treasury department, office of the supervising architect, Washington, D. C., until 3 o'clock p. m. on the 12th day of October, 1905, and then opened, for the construction complete, except elevator, of the United States postoffice and court house extension at Fargo, N. D., in accordance with drawings and specifications, copies of which may be had at this office or at the office of the custodian at Fargo, N. D., at the discretion of the supervising architect.

Mr. L. E. Thomas, formerly with the United Engineering & Foundry Co., of Pittsburg, has accepted the general management of the Birdsboro Steel Foundry & Machine Co., taking charge from August 1. Mr. Thomas is well known to the trade and was tendered the position of assistant general manager of the Republic Iron & Steel Co., whose engineering work on their new rail mill at Youngstown was in his charge, a month prior to his accepting his present position. Another piece of engineering work, ably conducted by Mr. Thomas, was that of the construction of the Ohio plant of the Carnegie Steel Co.

So much interest has recently been awakened in the possible economies of producer gas that many will be interested in the attractive catalogue of the Morgan Continuous Gas Producer and Automatic Feed. Much instructive information is given regarding the process itself and the possibilities of this modern method of securing the greatest heat value of fuel. The high degree of perfection attained by these producers is shown in some remarkable tests made by Robt. W. Hunt & Co. in which an average efficiency of 92 per cent was attained. 6x9, 50 pages with numerous illustrations. Morgan Construction Co., 40 Exchange Pl., New York City.

John F. Allen, 370-372 Gerard avenue, New York City, manufacturer of the "Allen" riveting machines, reports their July sales as follows: Jeffrey Manufacturing Company, Columbus, O.; Thompson Iron Works, Philadelphia, Pa.; Owego Bridge Company, Owego, N. Y.; Manning, Maxwell & Moore, New York; Levering & Garrigues Company, Dunnellon, N. J.; Morava Construction Company, Chicago, Ill.; New Castle Bridge Company, Indianapolis, Ind.; Interstate Engineering Company, Bedford, O.; American Car & Foundry Company, Wilmington, Del.; Cheboygan Boiler Works, Cheboygan, Mich.; American Car & Foundry Company, Jeffersonville, Ind.

The Central R. R. of New Jersey is keeping to the front with improvements and betterments, among the most notable of which is the recent ferry service to 23rd street, taking passengers almost direct to the shopping and theater districts. A new station house of brick and stone is under construction at Cranford, N. J., to cost about $25,000. The same attention is given to concrete construction that other roads have bestowed on the new wonder in structural operations. Culverts are put in with it to the exclusion of other material. A specially fine piece of reinforced concrete engineering is the viaduct of 30 foot span, going in at Philipsburg, in which sidewalks are provided for by wide portals at each side.

The Lackawanna Railroad is planning to replace its passenger terminal in Hoboken, which was destroyed by fire on August 7, and the officials state no efforts will now be spared to do this with the least possible delay. Until the new building is ready temporary waiting-rooms, dining room and other necessary facilities will be provided. Plans for the new terminal call for a vast ferry and railroad structure with sixteen tracks and six ferry slips. The buildings will be absolutely fireproof. Their construction will be of steel and concrete throughout. The main waiting room will be 150 feet square and 54 feet high with enormous windows on all sides. The restaurant will be on the main floor, over-looking the water with a view up and down the river, and a wide balcony projecting from the restaurant for dining out of doors in summer. Passengers from boats to train will not be compelled to pass through the main waiting-room but may use the forty-foot concourse leading to the tracks. The exterior of the building will be 600 feet long on the river side with a central tower 225 feet high. This tower will be electrically illuminated at night and its lighted clock faces will be one of the noticeable sights of the harbor.

Technical Publications

Practical Perpective, a Practical Explanation of the Only Practical Perspective Isometric is the title of a work by Frank Richards, associate editor "American Machinist," and Fred H. Colvin. Every mechanic, no matter what his line of business, is called upon at some time to read and interpret drawings, and often to make sketches to convey a mechanical idea. Facility in such work is of course only acquired by an acquaintance with correct principles and practice, and that is just what is made clear by the authors of this little book on Isometric drawing in a plain elucidation of the needed science of the subject by Mr. Richards, while the practical application of the principles to different industrial callings are furnished by Mr. Colvin, on Isometrically ruled paper. This little educational work is put out by the Derry-Collard Company, New York, at 50 cents. It is 5½x8 inches, bound in flexible linen, and has 56 pages of valuable material.